

the leakages of cold air into the furnace and Hues are thus kept at a minimum, because the gas pressure inside is nearer to the atmospheric pressure than it would be if the induced-draught system were used. Further, it is possible to open the large inspection doors and examine the lire without upsetting the furnace conditions. On the pure induced-draught system, the moment, the door is opened the state of gas flow is upset, the draught available on the fuel bed is reduced, and cold air pours into the furnace, and reduces the efficiency of the boiler to an alarming extent.

These remarks also apply to the ash tunnel where the doors have occasionally to be kept open, especially where a very low-grade fuel is employed, for comparatively long periods. From the point of view of efficiency of combustion, the balanced-draught system demands serious consideration.

Messrs, Babcock & Wilcox have recently introduced two types of forced-draught chain-grate stoker for burning low-grade fuel, one having a closed ashpit and the other with the compartments inside the chain. Further, angle-iron runners have been used for supporting the stoker links, with the result that the percentage of riddlings is said rarely to exceed some 5 per cent. Fig. 5 illustrates Messrs. Babcock's compartment-type forced-draught grate.

**Ash Handling.**-The question of how best to deal with ashes is a most important one.

When dealing with a low-grade fuel containing, say, 30 per cent of ash, the difficulty of burning the fuel so that the minimum of carbon is rejected with the ash is very considerably greater than it is with a fuel containing 25 per cent of ash. The increasing difficulty is out of all proportion to the increasing amounts of ash, and even the most expensive of ash-handling appliances demands the utmost consideration when low-grade fuels are to be burnt.

Perhaps the oldest ash conveyor was the iron-frame wheelbarrow, or bogie-wagon. Where this could be operated without great difficulty, it proved to be an extremely simple solution. Maintenance charges were

very low, and it had many other advantages. But the size of the boilers increased, and it was found quite impossible to deal with ash on the firing-floor level, so that tunnels had to be formed underneath the back end of the boiler, where the ashes could be specially dealt with.

Ordinary shaker, push-plate, and tray-type conveyors were tried in turn. In the case of the shaker conveyor, the trouble proved to be that when a very hot flow of ash was deposited on it at any one point, it cockled up by distortion and bent itself into all kinds of shapes and so became unworkable. The troubles with the push-plate and the tray types of conveyor were very similar, and a large staff was necessary to keep them in repair. Dry ash is a very abrasive material, and causes rapid wear to all the bolts and fittings it rubs against. It was considered that conveyors of this type were doing extremely well if their average life was as much as twelve months.

With all the schemes so far discussed, dust and fumes were the great difficulty. A new system—the pneumatic system did away with these